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Gloede, Oliver; Menkhoff, Lukas; Waibel, Hermann

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Risk attitude and risk behavior: Comparing Thailand and Vietnam*

Oliver Gloede,† Lukas Menkhoff,† Hermann Waibel†

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Abstract

Are responses to a simple survey item sufficiently reliable in eliciting risk attitudes? Our angle in examining reliability is to conduct comparative research across Thailand and Vietnam. We find, first, that the survey item is informative about individual risk attitude because it is plausibly related to socio-demographic characteristics (including vulnerability), it is experimentally validated and has some predictive power. Second, however, we find major differences between both countries: whereas explained variances of regressions are tentatively higher in Vietnam, the predictive value of the survey item is lower than in Thailand. Therefore, the survey item cannot be implemented across countries in an unreflected way.

JEL-Classification: O1 (economic development), R2 (household analysis), C93 (field experiment), D81 (decision making under risk)
Keywords: risk attitude, socio-economic survey, household behavior, field experiment

*We gratefully acknowledge financial support from the German Research Foundation (DFG FOR 756).
†Department of Economics, Leibniz Universität Hannover, Königsworther Platz 1, 30167 Hannover, Germany, Email: gloede@gif.uni-hannover.de, menkhoff@gif.uni-hannover.de, waibel@ifgb.uni-hannover.de

1 Introduction

Behavior towards risk is of undisputed relevance for economic behavior in general and economic development in particular. Accordingly, much effort has been invested in examining risk attitudes and in potentially learning about its impact on risk behavior. Development economists have early implemented field experiments in this respect (e.g. Binswanger, 1980). Experiments promise precision in revealing risk attitudes but are expensive in implementation. Therefore, simple survey items about risk attitude are an attractive alternative, even more as they can be integrated in standard household surveys. As a welcome consequence of this procedure, individual response items can be directly linked across fields of interest. In order to use survey items as approximations of risk attitudes on a broader scale it is important to know their reliability in various dimensions. However, evidence is still scarce in general and according to our knowledge completely missing with respect to cross-country studies. Therefore, we conduct such a study about the usefulness of a survey item on risk attitude across two countries, i.e. Thailand and Vietnam.

As the basis of our investigation we rely on a standard household survey being conducted in rural provinces of Northeast Thailand and Vietnam. This survey covers more than 2,000 households in each country and is representative for the respective areas. The survey contains an item revealing the risk attitude of respondents. Due to the survey structure, the response towards this item can be easily related to other characteristics of responding individuals. In particular, we are interested to analyze relations between the household's vulnerability and risk attitude. Thus we learn, separately for each country, whether stated preferences largely fit into the general literature or whether these preferences deviate to a large degree. This sheds light on the reliability of the survey item. More important, we can directly compare answers across the two countries which informs us about the applicability of the simple survey item beyond the sample in a single country.

Whereas these examinations tentatively inform about the reliability of the survey item with respect to socio-demographic characteristics, we also examine the reliability of the survey item with respect to explaining risk behavior in three more contexts. Its broader usefulness would be supported if the survey item can partially explain other kinds of behavior towards risk, which are

in our case the decision in a hypothetical investment case, the decision about being self-employed and the decision to spend money for lottery tickets. Again, we examine the "predictive" power of the survey item controlled for other potential determinants of risk behavior within each country and then compare the outcome across countries.

Finally, as a measure to test reliability of the survey item, we have added a standard field experiment to the survey's most recent wave eliciting risk attitude for exactly the same persons responding to the survey. Again, we test the survey's "predictive" power, here whether the survey outcome is able to predict the experimental outcome. If so, this indicates the positive relation between both measures and the usefulness of the survey item.

We get two main findings from our analysis: first, the survey item is informative about individual risk attitude because it is plausibly related to socio-demographic characteristics and has some predictive value; all this applies to Thailand and Vietnam. Second, however, there are major differences between both countries: whereas explained variances of regressions are tentatively higher in Vietnam, the predictive value of the survey item is clearly lower than in Thailand. As an interesting side-aspect, we find that persons living in households with higher vulnerability tend to respond in a more risk averse manner than others, indicating that not only lower income but also higher (income) vulnerability may reduce the willingness to take risk.

Our study fits into a long line of studies eliciting risk preferences. We are close to three strands: first, there are studies examining risk attitudes by various methods, in particular experiments (e.g. Harrison et al., 2007; Cardenas and Carpenter, 2008). Second, there are studies integrating risk considerations into a general household survey (e.g. Donkers and van Soest, 1999). Third, there are studies considering a survey item and an experimental measure within a single approach. This last strand of literature is pioneered for a German sample by Dohmen et al. (forthcoming) and has been extended in various directions (e.g. Lönnqvist et al., 2010; Tanaka et al., forthcoming). Within this strand, our research is closest to Hardeweg et al. (2011) who use the same survey as we do. However, we differ by extending the approach from Thailand also to Vietnam. Hence we are able to compare both countries. Moreover, we use different data due to a more recent survey wave (allowing for comparison over time) and we add vulnerability items to the analysis. Overall, our research is to the best of our knowledge the first to compare experimentally-validated risk attitudes across two countries. Reassuringly,

results are qualitatively similar in both countries; however, results are different enough between countries motivating further research.

The paper proceeds in the following steps: Section 2 introduces the data. Section 3 describes risk attitudes and examines their potential socio-economic determinants. The power of this risk attitudes in explaining three dimensions of risk behavior is examined in Section 4. Section 5 provides some more detailed robustness tests, including the experimental validation of the survey item, and Section 6 concludes.

2 Data collection and descriptive statistics

This section summarizes the data collection process (Section 2.1), describes typical characteristics of rural households in Thailand (Section 2.2) and then introduces the Vietnamese rural households by comparing them to their Thai counterparts (Section 2.3).

2.1 Data collection

The data that we use originates from the project "Impact of shocks on the vulnerability to poverty: Consequences for development of emerging Southeast Asian economies", funded by the German Research Foundation (FOR 756). Primary data was collected during a survey which was carried out in the Northeast region of Thailand and three provinces across Vietnam between April and June 2010. The countries are deliberately chosen as they are similar and different at the same time: they are similar regarding their size and regarding their development level, in particular in rural areas (whereas the central region in Thailand stands out due to high income per capita). By contrast, the two countries have different cultural and institutional backgrounds. Thailand is a Buddhist country (more than 90% of the population) following largely traditional open market policies with limited state interference. Vietnam, however, is characterized by the absence of important religious groups (about 80% of the population say to be atheists) and by several decades of a conventional socialist planning economy. Although the economy has been somewhat liberalized during the last 20 years, state enterprizes and state interferences are still important and more important than in Thailand. In each country 3 provinces are selected, namely Buri Ram, Ubon Ratchatani, Nakhon Phanom in Thailand and Ha Tinh, Thua Thien

Hue, Dak Lak in Vietnam.

The households selection process follows a three-stage stratified sampling procedure where provinces are constituting strata and the primary sampling units (PSU) are sub-districts. Within each of the 3 provinces, we exclude the urban area around the provincial capital city and confine the sample to the remaining rural areas. Within these sub-districts are randomly selected using population density weights. Within each sub-district, 2 villages are chosen at random, in which 10 households are randomly selected each. There are in total 4381 households from 440 villages in 220 sub-districts of the six provinces. Overall, the sampled households are representative for the rural areas in the six provinces.

The survey itself is a typical household survey, covering many areas of interest. These include rich information on household demographics, various aspects of social and economic behavior and in particular items addressing risk attitudes and risk behavior. We describe the information we need for our analysis in the following Section 2.2 on Thailand and Section 2.3 on Vietnam.

2.2 Description of rural households in Thailand

Due to the relative poverty of Northeastern Thailand and the discrepancy compared to the booming region of Central Thailand, parts of the local workforce migrate into urban areas and in particular towards the economic center. This is reflected in the household characteristics (see Table 1). Respondents are on average 52 years old[1], are mostly women (share of 60%) and household income is on average about 300 PPP-US-Dollar per person and month. Respondents experienced just 5 years of school education because during their youth the minimum school time was 4 years. The family situation is still traditional as people aged beyond 50 years will usually be grandparents, so that often three generations live in one household, although in various combinations. 83% of respondents are married, family size is 4 persons and the ratio of dependent over independent household members is 0.63.

(Insert Table 1 here)

[1] We exclude respondents aged below 18 and above 80 to make sure they are capable to understand the question. Due to this prevention measure the sample size decreases by 83 observations (2% of the sample).

Regarding the job situation of respondents, 13% are unemployed, 9% are self-employed and just 2% work as civil servants. Thus most respondents are employed in the private sector, which means in most cases that their occupation is related to the agricultural sector. Regarding the respondents' subjective well-being 11% feel sick. Overall, they are rather more than less optimistic with a value of 0.22 on a scale from -2 to 2. However, they seem to feel being heavily exposed to vulnerability, as they classify themselves at 1.77 on a scale from 0 to 2 (see Table A.1), expressing expected income fluctuations. The standard deviation of their household income over the last three years was about 6,000 PPP-US-Dollar which is very high compared to the experience of households in advanced economies.

In summary, sample characteristics show traditional rural households in an emerging economy where some brain drain takes place and where vulnerability of living conditions is high. We now compare this to our sample from Vietnam.

2.3 Rural households in Vietnam compared to Thailand

The situation of the Vietnamese rural households in our sample is different from the Thai households. The last column in Table 1 indicates many statistically significant differences between both samples. However, this result is more a statistical than an economically meaningful difference, driven by the large samples. Nevertheless, there are some patterns which may be interesting for the understanding of differences in risk attitudes.

Regarding personal characteristics of respondents, Vietnamese are 4 years younger than Thai and are less often female (48%). Measured in PPP-terms their household income is somewhat higher than in Thailand. Most important may be the better education as they have on average 38% longer schooling than their Thai counterparts.

Whereas the family and employment situation is very similar, with more civil servants in Vietnam (reflecting larger state influence in the economy), subjective measures of well-being differ. Vietnamese feel twice as often sick, but show the same degree of optimism. It is interesting to note that they regard their vulnerability (measured as expected income fluctuation) lower than Thai respondents, even though their past income fluctuations have been higher.

Overall, there are some differences between Thailand and Vietnam. In the next section we

analyze whether and how these are related to risk attitudes.

3 Risk attitudes in Thailand and Vietnam

3.1 Description of risk attitudes in Thailand and Vietnam

The risk attitudes of respondents are inquired by the simple question whether they are fully prepared to take risk or whether they avoid taking risk. The exact formulation is given in Figure 1 and follows the German Socio-Economic Panel Study (SOEP) which has been using this question (Dohmen et al., forthcoming). Respondents classify themselves on a scale between 0 and 10 so that category "5" represents the middle category. Due to the kind of question asked and due to the qualitative nature of the scale, the category with label 5 (middle category) does not indicate risk-neutrality. However, it is obvious that the lower the number of an answer, i.e. the stronger the tendency towards avoiding risk, the higher this respondent's degree of risk aversion.

The description of all responses is shown in Figure 1, giving the distribution of responses to the 11 categories. The mass of responses is on the left hand side of the figure, indicating that people tend towards risk avoidance. This holds for Thailand and for Vietnam. The spikes in the histograms at the extreme values and at the middle category are expected for rating scales in general and show up here for both countries. However, the share of responses at category 5 for Thailand seems to be unusually high and deserves further attention in the following section.

(Insert Figure 1 here)

3.2 Determinants of risk attitudes in Thailand

APPROACH. In explaining the individual risk attitude, here approximated by the response to the general survey item introduced above, we rely on a set of standard variables. These include demographic, socio-economic and subjective variables which are potential determinants of risk attitudes. Due to missing variables in several individual cases and since we want to work with a consistent sample, the sample size is reduced from 2,067 to 1,565. For estimations we use interval regressions and bootstrapped standard errors to take care of the nature of data, characterized by

interval scaling and by the non-normal distribution. We note that our results throughout do not depend on the particular econometric approach chosen but that we get qualitatively the same insights if we use ordinary least squares. Nevertheless, in order to address potential concerns regarding the kind of data, tables in this section rely on the methods described above if not stated otherwise.

RESULTS. We proceed with the regression approach in several steps. As starting point, specification (1) in Table 2 uses just a few potentially meaningful variables which can all be seen to a overwhelming degree as exogenous, i.e. the gender of respondents, their age and height (see Dohmen et al., forthcoming). We find that older and also female respondents are more risk averse than others, whereas height does not play a role.

(Insert Table 2 here)

If further potential determinants are added to this first specification, we find from specification (2) that formerly significant variables remain significant and that one additional variable shows a significant effect: respondents who are self-employed are willing to take more risk than others. In specification (3) we add further controls for regional effects - addressing potential differences between provinces - which will be discussed in the robustness section in more detail. The final specification (4) estimates a nested model via a backward selection algorithm to reduce the number of possible insignificant but distorting variables. The findings for the former models turn out to be quite robust. Overall, the result makes sense as it fits into the earlier literature: age is a standard determinant of risk attitude with the expected sign, the gender variable has the most often found sign. Self-employed has the expected sign but may be regarded as endogenous. It seems plausible that persons with higher risk tolerance more often choose self-employment than others.

MEDIAN ANSWERS. In order to address the surprisingly high share of responses to the median category 5, i.e. more than 40% of responses (see Figure 1), we propose three different approaches. First, we hypothesize that responses to category 5 may represent undecided respondents which nevertheless give an answer. An answer at the median response category may ensure a face saving situation and may avoid an embarrassing situation where either respondents had to confess their undecidedness or where interviewers might not be able to address respon-

dents' concerns adequately. If this hypothesis is true, we expect no distortion due to undecided respondents but rather an increase of noise. Thus, the regressions are repeated but respondents answering with category 5 are excluded from the sample. This reduces the new sample to 816 persons. Estimates are provided in Table A.2. The results largely confirm the former findings (Table 2) as all significant variables keep their sign, stay significant and no other variables become significant. It is revealing, however, that the R-squared of all regressions is about 50% higher, supporting the notion that undecided respondents increase noise. We conclude that the "category 5-respondents" do indeed not distort the structure of findings but contribute to more noise which supports the hypothesis of undecided respondents.

Second, we hypothesize that some respondents may have had problems fully understanding the meaning of this survey item and that they therefore answered with category 5. This might distort our analysis if category 5-respondents differ from others, e.g., in that these respondents actually have lower cognitive ability and a higher degree of risk aversion (Dohmen et al., 2010) which is masked by their category 5-responses. In order to test whether understanding may play a role in the choice of category 5, we group our sample into three sub-samples according to respondents' degree of education. The results, which are displayed in Table A.3, show indeed that explained variance increases for the two better educated groups, indicating that answers of the less educated increase noise in the data. Reassuringly, however, the structure of the three regressions is qualitatively the same, i.e. the estimated coefficient signs remain stable. The only exception occurs in the medium subsample where income variability seems to pick up a level effect and thus leads to the "wrong" sign at the income variable.

Third, in order to understand possible motivations of category 5-responses as comprehensive as possible, we compare personal characteristics of respondents answering category 5 with other respondents (see Table A.4). Especially young and badly educated are likely to chose the middle category of the rating scale. This underlines the two earlier explanations that less decided younger and less educated respondents may choose category 5 and thus contribute to a noisy data.

Overall findings on the median responses indicate a limitation to the feasibility of the survey item but do not overrule the general conclusion that the survey item is reliable to illicit risk preferences. To be on the safe side, we have rerun all examinations on the predictive ability of

risk attitudes for behavior towards risk (Section 4) by excluding the median category and get qualitatively unchanged results (available on request).

3.3 Determinants of risk attitudes in Vietnam

The use of survey items in practical field work would profit from their "universal" appropriateness. As a simple test of the general usefulness of this item, we repeat the exercise from Thailand in another country, i.e. Vietnam. We confirm that the survey based measure of risk attitude is plausibly linked to many correlates. In some contrast to Thailand there exist more statistically significant relationships.

RESULTS. Starting with specification (1) of Table 3 in parallel to Table 2 for Thailand, we get a result that is quite different from Thailand. In particular, the effect from age is strong but has the reverse sign. We address this issue in a later paragraph. The coefficient on female respondents has the expected sign but is insignificant, and the coefficient on height has an expected positive and significant sign. The explanatory power of this approach for the first specification is as low as in Thailand. Overall, we get a somewhat puzzling result for Vietnam which deserves further investigation.

(Insert Table 3 here)

When we add the full set of potentially important variables explaining risk attitude, specification (2) becomes much more conventional. First, many of the controls show up to be significantly correlated with risk attitudes, namely age, height, income, education, married, civil servant, sick, optimism, and vulnerability measures. Signs of these variables seem to be as expected in developing countries, in that being married and working as civil servant increases the ability to take risks and thus shows up as a less averse risk attitude in responses to the survey item. Second, the explanatory power increases to a R-squared of 19%.

AGE EFFECT. To address the unexpected sign of the age effect we plot the relationship in Figure A.1. Age has a clear hump-shaped pattern with a peak for the 50 year old cohort. We link this pattern to the Vietnam War. People facing war times are subject to fundamental risks which seems to shift their calibration of riskiness so that they appear as more risk loving when compared

to people without war experiences (Fearon, 1995). Accordingly, we construct a Vietnam War variable which counts the years from the war cohort, which consists of Vietnamese who were about 20 years old during the peak of the Vietnam War in 1968. Introducing this additional control variable in specification (3) makes the coefficient of the age variable insignificant and turns the sign into a conventional negative one. The war variable has the expected negative sign as it measures the time before or past the war.

4 Risk behavior in Thailand and Vietnam

After having described the similarities and differences between risk attitudes in Thailand and Vietnam we turn the focus to the predictive ability of the risk attitude measure for the respondents' risk behavior. Risk attitudes are shown to be a major determinant for decisions under risk (e.g. Dohmen et al., forthcoming). To test the predictive ability of the risk attitude measure in Thailand and Vietnam we correlate this measure with risk behavior of the respondents in three directions, i.e. the decision in an investment setting, about being self-employment, and about buying lottery tickets (see Hardeweg et al., 2011). For both countries risk attitude turns out to be a meaningful predictor of risk behavior, with results being more pronounced in Thailand than in Vietnam.

4.1 Investment decision

Investment decisions are fundamentally risky decisions. A common setup of all investment situations is the decision between two or more alternative investments with differing payoffs and probabilities. The risk preferences determine the decision for the risk structure of the portfolio.

In order to observe respondents' behavior in such an investment decision, we integrate a respective item into the survey which is designed as in Dohmen et al. (forthcoming). Respondents' decision on such a survey item is hypothetical by nature and in this sense possibly less reliable than real world investment decisions. However, the survey approach also has important advantages. First, real world investments will be heavily influenced by the investor's total assets which are hard to measure in rural household survey. Second, real world investments may also affect risk attitudes leading to biased estimates of the effect of risk attitude on investment.

These two possible distortions do not apply to a hypothetical investment decision.

Here, the respondent is given a large hypothetical lottery win of 100,000 THB/60 mill. VND. She is asked to decide about the share of this lottery win that she is willing to invest in a business with the following characteristics. This business has two outcomes with equal probability, i.e. 50% each: either the investment will double its value within a year or it will halve its value, so that the expected return is 25% p.a. being accompanied by quite some risk.

As regression model for explaining respondents' decision, i.e. the share of the lottery they decide to invest, we use least squares and bootstrap standard errors to account for the non-normality of investments and the risk attitude measure. Even though we do not obtain negative predictions nor predictions of larger than 100%, we also run a Tobit regression to account for these issues. The results are qualitatively the same and thus not presented here (results are available on request). Table 4 displays the results for both countries. In a first specification we just use the risk attitude to predict the investment decision. Specification (2) includes our first set of explanatory variables and specification (3) includes the full set of controls. Overall we find for both countries predictive power of risk attitude for investment decisions relative to other explanatory variables. For Thailand the predictive ability is remarkable.

(Insert Table 4 here)

Turning the discussion to Thailand first, we find that risk attitude explains about 26% of the investment decision. Adding one category on the risk attitude scale, i.e. about 10%, increases the share of investments by about 4.7%. This amounts to a 47% larger investment share of a risk loving household compared to a risk averse household. The effect is highly significant. Size and significance of the effect remain the same when adding more controls. No other explanatory variable is able to predict investment decisions better or to a larger extent. Only three other variables turn out to be significant predictors, and they indicate that respondents invest less when they are female, sick, and older. The full specification (3) increases the explained variance compared to the simple risk attitude item in specification (1) just by a ninth.

The results for Vietnam are qualitatively the same, even though the evidence for Vietnam is less clear cut and in particular less impressive for the survey item on general risk attitude. The adjusted R^2 is only about 4% in the base specification (column 4) with general risk attitude as

the single explanatory variable. Adding more controls increases the adjusted R^2 to more than 11% in the final specification (column 6). In all specifications risk attitude is highly significant and one of the most important variables in predicting investment decisions. Raising the general risk attitude by one category increases the investment share by 2.4%. Therewith an absolute risk loving respondent spends about 24% more on the risky investment than her absolute risk averse counterpart.

In summary, the survey item on the general risk attitude predicts behavior on the hypothetical investment decision quite well. It functions extremely well for Thailand and is also highly important throughout all specifications for Vietnam.

4.2 Self-employment

Entrepreneurship is another prominent example of risk behavior (see Knight, 1916; Drucker, 1970). Running a business incorporates the responsibility for decisions in a risky environment. Cash flows in business are not certain and will typically fluctuate more than in a position as employee. We are aware that the decision for being self-employed and (lower) risk aversion are interrelated: willingness to take risk is an obvious precondition for becoming self-employed but possibly enforced self-employment may lead to lower risk aversion too - self-employment is a matter of supply and demand (Caliendo et al., 2009). Since we cannot clearly identify causality we interpret results conservatively as correlates.

We implement a Probit model to estimate the correlation between risk attitude and the probability of being self-employed. Bootstrapped standard errors are used to account for non-normality. Table 5 displays the marginal effects at the mean observation. Risk attitudes are significantly related to self-employment. In terms of explained variance the evidence for Thailand is much stronger than for Vietnam. In the following we discuss the detailed results by country.

(Insert Table 5 here)

In Thailand risk attitudes alone explain about 4% of variance in self-employment. Raising risk aversion by 1% increases the probability to be an entrepreneur by 1%. The effect is highly significant and robust for all specifications. Even when we use the full set of controls the marginal

effect stays with 0.86% close to 1%. In the full specification (3) we explain about 9% of the variance. Overall this is an increase of about 50% compared to specification (1). We conclude that risk attitude is a major determinant of being self-employed.

For Vietnam we find similar results. Risk attitude is significantly correlated with self-employment, although less so than in Thailand. Increasing risk attitude by 1% goes along with an increase in the probability of being self-employed by 0.5%. The effect remains the same when we include a few more controls. But with adding the full set of controls the effect drops to 0.3% and loses significance. Spoken in explained variance the importance of risk attitude is limited in Vietnam. Risk attitude alone explains 1.5% whereas the full set of explanatory variables accounts for 30%.

In summary, the survey item on the general risk attitude predicts the decision of being self-employed - if we accept this possible influence here (being aware of reverse causality) - to quite some extent. For Thailand, the relation between survey item and self-employment is consistently close through all specifications, for Vietnam this relation is always weaker and even becomes insignificant when we use a large set of controls.

4.3 Lottery ticket purchase

Participation in lotteries is an obviously risky decision. Players spend money hoping for a lottery win despite their knowledge that lotteries typically have negative expected payoffs. Hence the purchase of lottery tickets is seen as a social behavior which is a good indicator for a small degree of risk aversion. The relationship is studied in numerous works (see for an overview on state lotteries Clotfelter and Cook, 1990).

Our survey measures the purchase of lottery tickets for the total household. Thus, the link between respondent and the purchase of tickets is not perfect as other members of the household may be responsible for this expenditure. Nevertheless, most respondents are the household head, who is defined as being responsible for the household expenditures. Even when the household head is not playing herself she will typically agree that part of the household income is spent for buying lottery tickets so that we expect a relation between respondents characteristics and lottery ticket purchase. Another concern often discussed in the context of rural household data is the lack of precision in data (Fisher et al., 2010). To give a conservative estimate of the effect

of risk attitude on playing lotteries, we focus on the decision to buy lottery tickets. Additional examinations explaining expenditures for lottery tickets are given in the appendix (see Table A.5) and are in support of the evidence presented here.

We estimate a Probit regression of the effect of risk attitude on buying lottery tickets. Standard errors are bootstrapped and results are presented in Table 6. Risk attitude is significantly correlated to lottery ticket purchase and is a major predictor in Thailand. This also holds when we use various sets of control variables as indicated by specifications (2) and (3) in Table 6. Throughout these modifications the marginal effect remains remarkably stable; a marginal increase in risk attitude results in about 2.3% higher probability of buying a lottery ticket. With this features risk attitude turns out to be the dominant predictor for lottery expenditures in Thailand.

(Insert Table 6 here)

Whereas 55% of households in Thailand buy lottery tickets, this share is very low in Vietnam with 4% as other forms of risk gambles and bets prevail. Accordingly, the result for Vietnam is not strong: economically the coefficient on the general risk attitude variable is just one tenth of the Thai case which results in statistical insignificance. Also in terms of explained variance risk attitude can explain only a small fraction compared to the other controls. This observation is due to the small share of households purchasing lottery tickets in Vietnam.

In summary, the survey item on the general risk attitude predicts the decision of lottery ticket purchase surprisingly well, if considered that we have to link individual risk attitude with the behavior of various persons in a household. As in the earlier cases, it functions better for Thailand than for Vietnam.

5 Validation of risk attitudes

This section informs about additional examinations supporting the usefulness of the survey-based measure of risk attitude. Section 5.1 compares the survey item to an experimental measure of risk attitude, although for one province in each country only. Section 5.2 examines our results for Thailand over time by comparing it to the outcomes in Hardeweg et al. (2011) who follow

the same approach as we do based on an earlier wave of the survey in Thailand. Section 5.3 analyzes whether considering a survey measure of loss aversion reduces the explanatory power of the survey item on risk attitude. Finally, Section 5.4 discusses potential sources of the strong provincial differences in Thailand which do not seem to be due to an interviewer bias.

5.1 Experimental validation of risk attitudes

We validate the survey-based results on risk attitudes by a highly incentivized Holt & Laury-type experiment (Holt and Laury, 2002). The design of this experiment closely follows Dohmen et al. (forthcoming) and several further studies which repeat this experiment with different groups and for various purposes. Basically, respondents make 20 decisions between a safe payoff and a lottery, where the lottery is unchanged but the safe payoff increases steadily from decision to decision.

In Thailand, for example, the safe payoff starts at 0 Baht and increases by 20 Baht per decision, i.e. it goes up to 380 Baht, whereas the lottery is a 50% chance of winning 600 Baht, i.e. the expected value is 300 Baht. Due to this design and the ordering of choices, respondents will sooner or later start preferring a safe amount: most respondents start preferring the lottery with an expected value of 300 Baht against a safe payoff of 0, 20 or 40 Baht but will prefer a safe payoff of say 300 Baht or more compared to an expected lottery value of 300 Baht. Accordingly, individual risk attitude is characterized by the specific decision where respondents start preferring the safe amount. In order to support consistent and reliable decision making, respondents are informed ex ante that one of the 20 decisions will be randomly selected and played afterwards with real money (more details in Hardeweg et al., 2011). The money at stake is quite high as an expected lottery value of 300 Baht is about a two day full salary for a "regular" worker in rural Northeast Thailand. Monetary incentives in Vietnam are also in local currency (DATA) and are equal to Thailand regarding their incentive.

The histogram of minimum preferred safe payoffs, characterizing risk attitude, is shown for both countries in Figure 2. It becomes obvious that most responses tend towards the left and almost all are at or below row 16, i.e. in Thailand the safe amount of 300 Baht. That implies that most respondents are risk averse as expected, a few are risk neutral (at row 16) and only a share of about 14% in Thailand and 10% in Vietnam is risk loving. This outcome makes sense

and fits to the outcomes of earlier studies. However, we are interested in the relation of the survey item on risk attitude to this experiment. Therefore, it is reassuring that both measures are positively correlated. The Spearman rank correlation coefficient between both measures is 0.30 in Thailand and 0.14 in Vietnam. Both coefficients are significant at the 1% confidence level.

(Insert Figure 2 here)

In order to examine the relation between the survey measure and the experimental measure on risk attitude in more detail, we use the survey item as right hand side variable in explaining the experiment outcome. In a first step, we just relate the two measures in the above used standard procedure of interval regressions and in further steps we add more control variables. As Table 7 shows, the survey item of general risk attitude has a quite consistent explanatory power in determining the experimental outcome.

(Insert Table 7 here)

In Thailand, the respective coefficient is highly significant in specification (1), its size decreases a bit when adding more variables so that significance becomes borderline. Nevertheless, the result is consistent and largely significant. Outcomes in Vietnam are even clearer, as the coefficient is larger and through all specifications highly statistically significant.

In summary, we conclude that the experiment tentatively validates the findings of the survey based measure.

5.2 Risk attitudes over time

As another approach in testing the validity of our results we are fortunately able to compare results for Thailand over time. Hardeweg et al. (2011) have followed basically the same approach as we do, however, for Thailand only. They use an earlier wave of the same survey, so that we really provide an out-of-sample test by using the wave of 2010. We state that results are qualitatively the same across both waves. This applies to descriptive statistics as well as to regressions.

In detail, however, there are some differences. First, we use the full survey in three provinces as a the baseline sample, whereas Hardeweg et al. (2011) use the province of Ubon Ratchathani, because the experiment has been conducted in this province only. Second, we include vulnerability measures in all regressions which may influence values of other coefficients. Third, we have doubled the monetary incentive in the experiment, however, without receiving clearly better or just different results. This may be a bit surprising and may indicate that the incentive of a full-day salary in Hardeweg et al. (2011) already gives sufficient incentives.

Thus, we conclude that results are robust over time but we note some variability which should caution possible overinterpretation of results.

5.3 Risk aversion versus loss aversion

In order to further test robustness of our approach, we complement the simple survey item about risk attitude by another survey item about loss aversion. This procedure may inform whether loss aversion is possibly a better description of behavior towards risk or whether loss aversion provides a useful measure in addition to the general risk attitude. In any case, are the findings on risk attitude robust to the inclusion of loss aversion in our regressions?

In order to infer individuals' loss aversion we define the hypothetical setup of two different days. During day A nothing particular happens. For day B the household is supposed to imagine a lottery win of 1,000 Baht/ 600,000 Dong. During day B also the TV set breaks down. We ask the household how much the repair cost could be at maximum to feel days A and B equally happy days. For our measure of loss aversion we calculate the relative repair cost to the lottery win, i.e. larger values correspond to less loss aversion.

The outcome of this item is then included in the regression presented above. As most relations are not substantially changed by this additional variable we are not interested in details and thus present in the following condensed results in the Appendix Table A.7. There we consistently show results for both countries in parallel, i.e. on the left and right hand side of the various panels. Panel A just gives the coefficient on loss aversion in the same specification determining general risk attitude as in the former Tables 2 and 3, here, however, estimated with the additional variable on loss aversion. We find that loss aversion does not seem to matter in Thailand, i.e. it

is independent from our survey measure of risk attitude. The situation is different in Vietnam, where the loss aversion variable is positively related to the risk measure.

Panel B shows results for the investment game. Again, we present here the coefficient of loss aversion only, which has been added to specifications (1) to (3) in Table 4 for both countries. We find that loss aversion helps understanding the behavior of respondents in the investment game to some degree in Thailand but not in Vietnam. We proceed in the same way regarding explaining the decision being self-employed. Panel C shows that loss aversion is related to self-employment in Vietnam but not in Thailand. We find no influence of loss aversion in Panel D where we cover the decision buying lottery tickets. If we focus on the expenditures on lottery tickets, shown in Panel E, we find that loss aversion matters in Thailand in addition to the general risk attitude.

In summary, findings indicate that loss aversion as we have measured here is somewhat different from our survey-based risk measure in Thailand and thus sometimes helps explaining behavior towards risk. In Vietnam, however, the loss aversion measure seems to be rather a minor aspect of the general risk attitude and thus does not have explanatory power as additional variable. Most important for our research here is the fact that in both cases the inclusion of the loss aversion variable does not alter our findings.

5.4 Provincial differences

As a final issue in this section we examine the high importance of the provincial dummies in most regressions in both countries. Generally, province dummies may either reflect regional differences or measurement error. Regional differences may be valid because the Thai provinces are all located in the same region, but this region is quite large. The Northeast of Thailand covers about a third of the country regarding size and population (about 20 mill. people). It is thus in itself comparable to a medium sized country. Moreover, there are obvious differences in economic structure, income level and culture. Economic structure is difficult to capture by simple variables. The importance of income differences becomes evident by the fact that the inclusion of provincial dummies dominated the income effect at the household level which turns insignificant (see Table 3). Potential cultural differences are indicated by regional dialects.

The case is possibly even clearer in Vietnam, as the provinces are scattered across the whole

country and not concentrated in a particular region. In sum, there are good reasons to believe that provincial differences are real and may effect the survey outcome.

However, there may also be the suspicion that these dummies could reflect interviewer differences and would measurement error. In order to test this potential influence, we make use of the fact that the survey in the largest province in Thailand, i.e. Ubon Ratchathani, was conducted by two teams. Therefore, we run tests whether results differ systematically between both teams which is not the case (results available on request).

6 Conclusion

This research addresses a question of great importance for practical purposes in development research and policy: if we want to reveal risk attitudes of individuals, are responses to a simple survey item sufficiently reliable? Our angle in examining reliability is to conduct comparative research across Thailand and Vietnam. As we build on earlier work in Thailand by Hardeweg et al. (2011) our contribution can be seen in this respect as an out-of-sample test. We focus on the comparison between both countries but we also report robustness of findings over time within Thailand. All this provides our first finding that the survey item is a useful proxy of risk attitude. This is supported by three facts: the survey item is plausibly related to similar socio-demographic characteristics of respondents in both countries, the survey item helps explaining behavior towards risk in different environments and the survey response is reliable, evidenced by its close relation to an experimental measure of risk attitude and by its stability over time (available for Thailand only).

In comparing the outcome across both countries, we receive our second finding, that is major differences in responses. Despite the overall similarity in the direction of responses, the size of coefficients is very different across countries: first, the survey item in Vietnam can be much better explained by socio-economic variables. If one interprets this fact as indication for the usefulness of the measure, one will be disappointed by a second difference across countries. We find that risk attitude in Vietnam predicts behavior much less than in Thailand. This second difference suggests that the survey item works better in Thailand, possibly because it captures behavior towards risk that is independent from socio-economic influences. In this sense the survey item may be the better measure in Thailand. Overall, we learn that a survey item can

perform differently across countries, a lesson being supported by strong regional effects in both countries.

As a final finding, independent from the cross-country comparison, we have included two measures of household vulnerability as control variables in regressions and see that they tentatively help explaining risk attitude and risk behavior. Living in more vulnerable circumstances is obviously related to more risk averse attitude and behavior, possibly because these persons cannot afford to take risk.

Overall, we are glad to report that a simple survey item is helpful in understanding behavior towards risk. However, results in Vietnam are much weaker than in Thailand and thus warn about just spreading such a measure across countries. We rather conclude that further experimentation with survey items and experimental design are highly welcome.

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Table 1: Descriptive statistics by country

The table presents summary and inference statistics by country. Dummy variables are denoted by †. Test of differences between the two countries are by Fisher's exact test for binary variables. For the remaining variables we apply the Wilcoxon-Mann-Whitney test. Respective p-values for those mentioned tests are given in the last column. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%). The definition of variables is discussed in table A.1 and chapter 2.

	Thailand					Vietnam					Difference
Variable	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	(p-value)
Female†	2067	0.60	0.49	0	1	2046	0.49	0.50	0	1	0.000***
Age	2067	52.13	12.51	18	80	2046	47.75	13.18	18	80	0.000***
Height	2067	1.58	0.08	1.06	1.85	2046	1.58	0.07	1.05	1.85	0.259
Income (1000 USD-PPP)	1761	15.36	15.90	-8.83	78.54	1721	18.35	21.81	-12.32	112.87	0.099*
Education	1993	5.38	2.71	1	17	1841	7.40	2.96	1	17	0.000***
Married†	2067	0.83	0.38	0	1	2046	0.85	0.35	0	1	0.050**
Household size	2067	4.02	1.74	0	18	2046	4.26	1.73	1	13	0.000***
Dependency ratio	1969	0.63	0.70	0	5	1943	0.64	0.67	0	5	0.542
Self-employed†	2063	0.09	0.29	0	1	2040	0.10	0.30	0	1	0.313
Unemployed†	2063	0.13	0.34	0	1	2040	0.10	0.30	0	1	0.002***
Civil servant†	2063	0.02	0.13	0	1	2040	0.04	0.20	0	1	0.000***
Sick†	2067	0.11	0.32	0	1	2046	0.23	0.42	0	1	0.000***
Optimism	2063	0.44	0.81	-2	2	1985	0.44	0.64	-2	2	0.969
Vulnerability perceived	2067	1.78	0.66	1	3	2042	1.52	0.58	1	3	0.000***
Vulnerability income	1558	6.92	7.92	0.13	43.30	1543	10.02	11.69	0.03	62.22	0.000***
Vietnam war	.	.	.	.	.	2046	17.42	10.14	0	45	.
General risk attitude	2067	4.67	2.56	0	10	2046	4.16	2.75	0	10	0.000***
Minimum acceptable offer (row)	896	9.26	6.16	1	21	684	8.36	5.37	1	21	0.031**
Investment fraction in game (%)	2065	48.14	25.70	0	500	2046	55.76	34.23	0	100	0.000***
Buyer of lottery tickets†	1876	0.55	0.50	0	1	2045	0.04	0.20	0	1	0.000***
Lottery purchases (USD-PPP)	2067	41.01	67.93	0	276	2046	2.01	25.76	0	993.3	0.000***

Figure 1: Histogram of general risk attitude by country

General risk attitude is a survey item which asks the respondent for her risk attitude on a rating scale, which ranges from 0 (unwilling to take risk) to 10 (fully prepared to take risks)".

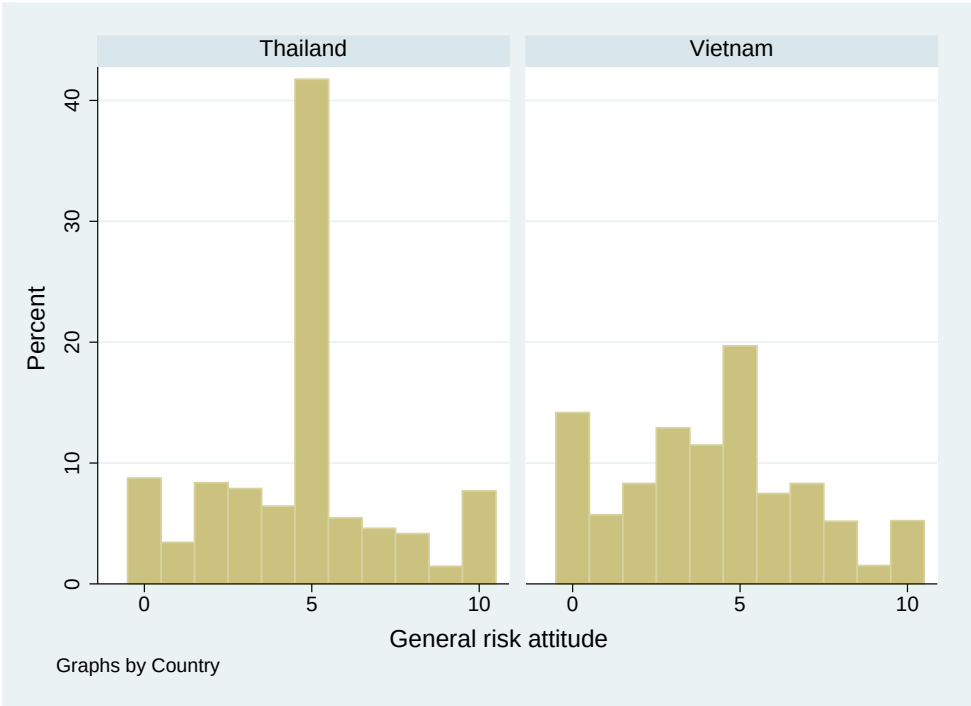

Table 2: Determinants of general risk attitude in Thailand

Interval regression of general risk attitude, measured on a rating scale on which larger values represent risk lovingness. The highest category is estimated as an open interval, the lowest as a closed interval. Bootstrapped standard errors are displayed in parenthesis. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

Specification	(1)	(2)	(3)	(4)
Female†	-0.325**	-0.312*	-0.302*	-0.347**
	(0.163)	(0.189)	(0.165)	(0.138)
Age	-0.0289***	-0.0224***	-0.0237***	-0.0282***
	(0.00578)	(0.00789)	(0.00840)	(0.00567)
Height	0.583	0.401	0.457	
	(1.027)	(1.037)	(1.207)	
Income (1000 USD-PPP)		0.0221	0.00569	
		(0.0192)	(0.0201)	
Education		0.0504	0.0414	
		(0.0380)	(0.0360)	
Married†		-0.154	-0.186	
		(0.202)	(0.192)	
Household size		-0.0176	-0.00325	
		(0.0425)	(0.0523)	
Dependency ratio		-0.101	-0.119	
		(0.103)	(0.114)	
Self-employed†		0.899***	0.864***	0.907***
		(0.213)	(0.256)	(0.273)
Unemployed†		-0.0481	-0.0936	
		(0.250)	(0.194)	
Civil servant†		-0.856	-0.863	
		(0.656)	(0.668)	
Sick†		-0.00458	0.115	
		(0.221)	(0.186)	
Optimism		-0.0177	-0.00261	
		(0.0921)	(0.0902)	
Vulnerability perceived		-0.0592	0.0111	
		(0.0897)	(0.0963)	
Vulnerability income		-0.0215	-0.00133	
		(0.0370)	(0.0405)	
Buriram†			0.947***	1.013***
			(0.213)	(0.203)
Ubon Ratchathani†			1.094***	1.117***
			(0.166)	(0.178)
Constant	5.884***	5.723***	4.860**	5.866***
	(1.756)	(1.890)	(2.139)	(0.362)
$ln(sigma)$	0.928***	0.919***	0.906***	0.909***
	(0.0215)	(0.0187)	(0.0195)	(0.0178)
Observations	1,413	1,413	1,413	1,413
McKelvey & Zavoina's R^2	0.0199	0.0381	0.0628	0.0579

Table 3: Determinants of general risk attitude in Vietnam

Interval regression of general risk attitude, measured on a rating scale on which larger values represent risk lovingness. The highest category is estimated as an open interval, the lowest as a closed interval. Bootstrapped standard errors are displayed in parenthesis. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

Specification	(1)	(2)	(3)	(4)
Female†	-0.128	0.0326	0.0447	
	(0.188)	(0.174)	(0.167)	
Age	0.0162**	0.0220***	-0.00933	
	(0.00658)	(0.00688)	(0.0160)	
Height	2.600**	1.973*	3.103**	2.917***
	(1.297)	(1.123)	(1.219)	(1.106)
Income (1000 USD-PPP)		0.0789***	0.0360*	0.0406*
		(0.0234)	(0.0195)	(0.0212)
Education		0.0719***	0.0738***	0.0748***
		(0.0277)	(0.0248)	(0.0230)
Married†		0.533**	0.514**	0.534***
		(0.244)	(0.243)	(0.205)
Household size		0.0123	0.0456	
		(0.0436)	(0.0527)	
Dependency ratio		-0.00376	-0.0222	
		(0.127)	(0.121)	
Self-employed†		0.453	0.405	
		(0.357)	(0.330)	
Unemployed†		0.104	0.220	
		(0.330)	(0.249)	
Civil servant†		1.497***	1.343***	1.292***
		(0.452)	(0.405)	(0.436)
Sick†		-0.752***	-0.605***	-0.600***
		(0.196)	(0.158)	(0.162)
Optimism		0.699***	0.603***	0.601***
		(0.130)	(0.0995)	(0.114)
Vulnerability perceived		-0.771***	-0.665***	-0.669***
		(0.126)	(0.139)	(0.140)
Vulnerability income		-0.122***	-0.0641*	-0.0708*
		(0.0432)	(0.0369)	(0.0396)
Ha Tinh†			1.410***	1.320***
			(0.248)	(0.202)
Thua Thien Hue†			1.727***	1.724***
			(0.174)	(0.152)
Vietnam war			-0.0322	-0.0216***
			(0.0203)	(0.00662)
Constant	-0.174	0.135	-0.753	-0.830
	(2.188)	(1.869)	(2.525)	(1.793)
$ln(\sigma)$	0.983***	0.884***	0.847***	0.849***
	(0.0186)	(0.0187)	(0.0189)	(0.0204)
Observations	1,254	1,254	1,254	1,254
McKelvey & Zavoina's R^2	0.0130	0.190	0.248	0.245

Table 4: Determinants of investment

Least squares regression of the investment decision in an experimental setting, i.e. the percentage of a windfall gain which the household decides to invest in a risky investment. Bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
Specification	(1)	(2)	(3)	(4)	(5)	(6)
General risk attitude	4.679***	4.484***	4.514***	2.415***	2.420***	2.174***
	(0.306)	(0.249)	(0.330)	(0.348)	(0.373)	(0.402)
Female†		-5.994***	-5.514***		-6.282***	-3.068
		(1.362)	(1.319)		(2.033)	(2.981)
Age		-0.249***	-0.155***		-0.418***	-0.192**
		(0.0426)	(0.0590)		(0.0837)	(0.0835)
Height		3.319	0.960		23.24*	24.77
		(6.742)	(7.398)		(13.03)	(15.94)
Income (1000 USD-PPP)			-0.207			-0.533**
			(0.149)			(0.258)
Education			0.446			0.739**
			(0.279)			(0.340)
Married†			2.181			4.191
			(1.527)			(3.871)
Household size			0.600			3.042***
			(0.386)			(0.657)
Dependency ratio			-1.175			-1.867
			(0.755)			(1.299)
Self-employed†			0.503			5.620
			(2.399)			(3.454)
Unemployed†			-0.959			-4.839
			(1.947)			(4.891)
Civil servant†			0.142			-7.611
			(4.698)			(5.507)
Sick†			-3.095**			-1.041
			(1.533)			(2.332)
Optimism			0.0887			3.984***
			(0.595)			(1.427)
Vulnerability perceived			-0.180			1.141
			(0.983)			(1.714)
Vulnerability income			0.401			1.116**
			(0.267)			(0.455)
Buriram†			-0.989			
			(1.912)			
Ubon Ratchathani†			-1.891			
			(1.487)			
Ha Tinh†						-5.686**
						(2.711)
Thua Thien Hue†						2.189
						(2.599)
Constant	25.92***	37.89***	32.73**	46.63***	32.24	-5.218
	(1.651)	(11.51)	(13.07)	(1.752)	(21.37)	(29.43)
Observations	1,411	1,411	1,411	1,254	1,254	1,254
Adjusted R^2	0.266	0.292	0.293	0.0378	0.0718	0.114
Smallest prediction	25.92	17.10	12.02	46.63	25.48	5.572
Largest prediction	72.72	81.09	82.65	70.78	85.55	97.45

Table 5: Determinants of self-employment

Probit regression of being self-employed. Marginal effects (at mean observation) are displayed, bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
Specification	(1)	(2)	(3)	(4)	(5)	(6)
General risk attitude	0.0101***	0.00932***	0.00859***	0.00564*	0.00620***	0.00291
	(0.00219)	(0.00242)	(0.00251)	(0.00288)	(0.00209)	(0.00191)
Female†		0.00175	0.00442		0.0794***	0.0678***
		(0.0142)	(0.0133)		(0.0209)	(0.0161)
Age		-0.00157***	-0.00120*		-0.00148**	-0.000887*
		(0.000498)	(0.000654)		(0.000613)	(0.000511)
Height		-0.0231	-0.0408		0.356***	0.239***
		(0.108)	(0.0796)		(0.119)	(0.0877)
Income (1000 USD-PPP)			0.00330			0.00542**
			(0.00226)			(0.00223)
Education			0.000340			0.00293
			(0.00331)			(0.00193)
Married†			0.00659			0.0119
			(0.0168)			(0.0157)
Household size			-0.00466			-0.000446
			(0.00420)			(0.00338)
Dependency ratio			-0.00460			0.00155
			(0.00926)			(0.00793)
Sick†			0.0235			0.0106
			(0.0275)			(0.0167)
Optimism			0.0163*			0.00826
			(0.00903)			(0.00917)
Vulnerability perceived			0.0102			-0.0222**
			(0.00800)			(0.0113)
Vulnerability income			-0.00505			-0.00937**
			(0.00445)			(0.00405)
Buriram†			-0.0106			
			(0.0201)			
Ubon Ratchathani†			0.00849			
			(0.0184)			
Ha Tinh†						-0.0771***
						(0.0157)
Thua Thien Hue†						0.00560
						(0.0128)
Observations	1,413	1,413	1,413	1,254	1,254	1,254
McKelvey & Zavoina's R^2	0.0382	0.0597	0.0912	0.0141	0.118	0.301

Table 6: Determinants of lottery buyer

Probit regression of being self-employed. Marginal effects (at mean observation) are displayed, bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
Specification	(1)	(2)	(3)	(4)	(5)	(6)
General risk attitude	0.0237***	0.0223***	0.0233***	0.00228	0.00201	0.00239
	(0.00496)	(0.00596)	(0.00588)	(0.00180)	(0.00208)	(0.00187)
Female†		0.0279	0.0277		0.00954	0.0105
		(0.0272)	(0.0394)		(0.0140)	(0.00957)
Age		-0.00358***	-0.00474***		-6.11e-05	5.07e-05
		(0.000985)	(0.00128)		(0.000534)	(0.000458)
Height		-0.0392	-0.0491		0.172*	0.115*
		(0.194)	(0.221)		(0.103)	(0.0626)
Income (1000 USD-PPP)			0.00850**			0.00225**
			(0.00355)			(0.000984)
Education			-0.0136**			0.000466
			(0.00589)			(0.00196)
Married†			-0.00357			-0.000262
			(0.0453)			(0.0192)
Household size			0.00455			0.00110
			(0.00986)			(0.00318)
Dependency ratio			-0.0134			-0.00682
			(0.0230)			(0.00479)
Self-employed†			-0.0157			-0.0217***
			(0.0673)			(0.00795)
Unemployed†			0.0159			0.0175
			(0.0525)			(0.0261)
Civil servant†			0.0597			0.0148
			(0.190)			(0.0316)
Sick†			-0.00338			-0.00933
			(0.0492)			(0.0105)
Optimism			-0.0119			-0.00232
			(0.0177)			(0.00709)
Vulnerability perceived			0.0364*			-0.000591
			(0.0213)			(0.00764)
Vulnerability income			-0.0162**			-0.00554***
			(0.00684)			(0.00180)
Buriram†			-0.0114			
			(0.0495)			
Ubon Ratchathani†			-0.0187			
			(0.0394)			
Ha Tinh†						-0.0185
						(0.0133)
Thua Thien Hue†						-0.0130
						(0.0108)
Observations	1,310	1,310	1,310	1,253	1,253	1,253
McKelvey & Zavoina's R^2	0.0236	0.0378	0.0535	0.00667	0.0268	0.179

Figure 2: Histogram of minimum acceptable offer by country

We elicit risk preferences in a field experiment. Details for the experimental design are discussed in section 5.1.

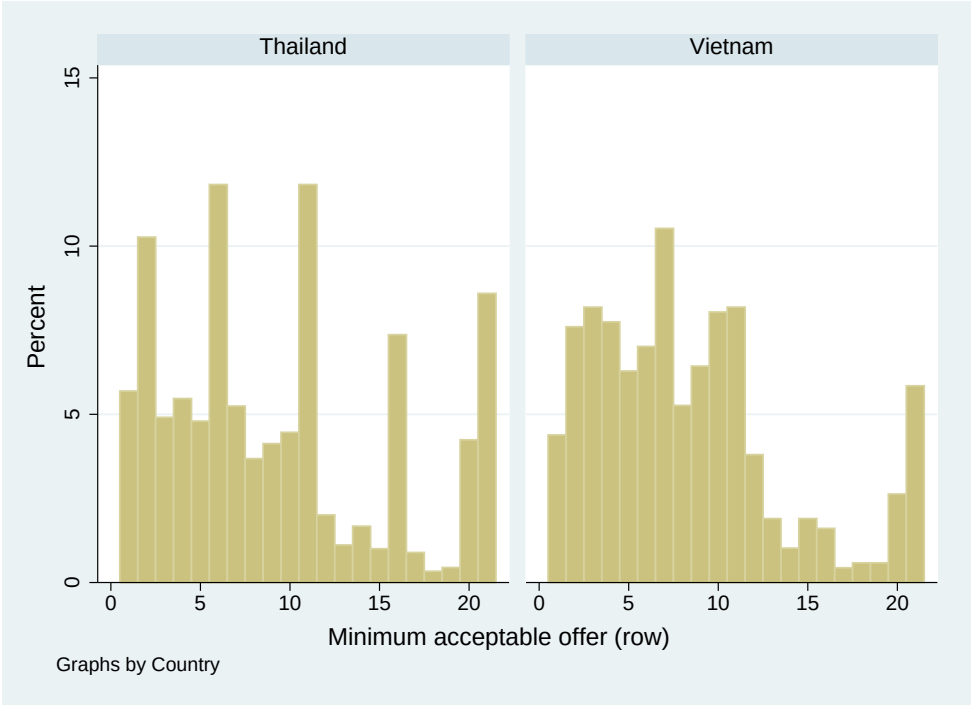

Table 7: Determinants of minimum acceptable offer

Interval regression of minimum acceptable offer. Larger values represent higher certain pay-offs for which the respondent favors taking the certain amount rather playing the lottery. I.e. larger values correspond to more risk lovingness. The highest category is estimated as an open interval, the lowest as a closed interval. Bootstrapped standard errors are displayed in parenthesis. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
Specification	(1)	(2)	(3)	(4)	(5)	(6)
General risk attitude	0.217**	0.150*	0.144	0.368***	0.366***	0.309**
	(0.0971)	(0.0812)	(0.0972)	(0.108)	(0.0957)	(0.137)
Female†		-0.480	-0.234		-0.692	-0.997
		(0.584)	(0.560)		(0.680)	(0.794)
Age		-0.0665***	-0.0453*		-0.0244	-0.0233
		(0.0201)	(0.0271)		(0.0197)	(0.0729)
Height		-0.437	0.544		1.960	-0.419
		(4.078)	(3.530)		(4.567)	(4.561)
Income (1000 USD-PPP)			0.0317			-0.0373
			(0.0617)			(0.0664)
Education			0.117			0.140
			(0.121)			(0.0876)
Married†			-1.091*			-0.382
			(0.626)			(0.837)
Household size			-0.118			-0.207
			(0.143)			(0.167)
Dependency ratio			0.0629			0.288
			(0.397)			(0.483)
Self-employed†			-1.778**			3.361***
			(0.780)			(1.205)
Unemployed†			-2.523***			-0.566
			(0.831)			(1.112)
Civil servant†			-2.933**			-1.537
			(1.155)			(1.278)
Sick†			1.630*			-0.597
			(0.885)			(0.617)
Optimism			0.301			0.373
			(0.297)			(0.550)
Vulnerability perceived			-0.122			-0.273
			(0.431)			(0.516)
Vulnerability income			-0.0218			0.256**
			(0.115)			(0.122)
Vietnam war						-0.0186
						(0.0832)
Constant	8.742***	13.42*	11.56*	7.596***	5.827	10.11
	(0.518)	(7.008)	(6.437)	(0.384)	(7.508)	(9.787)
$ln(\sigma)$	1.805***	1.797***	1.781***	1.613***	1.608***	1.571***
	(0.0228)	(0.0222)	(0.0240)	(0.0501)	(0.0496)	(0.0453)
Observations	635	635	635	386	386	385
McKelvey & Zavoina's R^2	0.00854	0.0242	0.0559	0.0358	0.0455	0.113

A Appendix

Table A.1: Variable description

Variable	Description
Female	Dummy variable for females. Takes the value 1 for females and 0 elsewise.
Age	Age in years.
Height	Height in meters.
Income (1000 USD-PPP)	Total net household income in the perdiod from May, 2009 to April, 2010, including net earnings from farming, business, farm and off-farm employment, lending, saving, remittances and public transfers.
Education	Education in years.
Married	Dummy variable for being married. Takes the value 1 for married and 0 elsewise.
Dependency ratio	Ratio of dependent over independent household members. Dependent household members are all members who are younger than 15 years or older than 64 years.
Household size	Head count of nucleus household members.
Self-employed	Dummy variable for being self-employed. Takes the value 1 for self-employed and 0 elsewise.
Unemployed	Dummy variable for being unemployed. Takes the value 1 for being unemployed and 0 elsewise. Unemployment targets the economically inactive, i.e. elderly, people incapable to work, and people on job search.
Civil servant	Dummy variable for working in the public sector. Takes the value 1 for being an offical and 0 elsewise.
Sick	Dummy variable for being sick. Takes the value 1 for being sick and 0 elsewise. Sickness is based on a self-reported scale which separates healthy, can manage, and sick.
Optimism	Expectation for the personal future in the next year on a rating scale. which distinguishes 5 categories from -2 (pessimistic) to +2 (optimistic).
Vulnerability perceived	Self reported vulnerability as the perceived degree to which income fluctuates on a rating scale which ranges from 0 (not volatile at all) to 2 (very volatile).
Vulnerability income	Measured standard deviation of the total net household income in the years 2007, 2008, 2010. We compute vulnerability only from those households which report income in every year.
Minimum acceptable offer	Minimum acceptable offer refers to the chosen offer in a Holt & Laury-type experiment (Holt and Laury, 2002). Respondents choose between a risky and a certain pay-off in 20 setups. The smallest certain payoff which is preferred to playing the lottery is called minimum acceptable offer. I.e. larger values correspond to more risk lovingness. Here the outcome x_i corresponds to the n-th certain offer.
General risk attitude	General risk attitude is a survey item which asks the respondent "Are you generally a person who is fully prepared to take risks or do you avoid taking risks? Please choose a number on a scale from 0 (unwilling to take risk) to 10 (fully prepared to take risks)"
Investment fraction (%)	Fictional share in per cent of 100,000 THB/60 mill. VND to invest in a hypothetical business opportunity with the opportunity to double or halve the investment.
Lottery expenditures (USD-PPP)	Total amount of household expenses for lotteries between May 2009 and April 2010
Buyer of lottery tickets	Dummy variable for living in a household which buys lottery tickets. Takes the value 1 for buying and 0 elsewise.

Table A.2: Determinants of general risk attitude in Thailand (excl. gra_i=5)

Interval regression of general risk attitude, measured on a rating scale on which larger values represent risk lovingness. Respondents choosing the middle rating (5) of the risk attitude rating are excluded. The highest category is estimated as an open interval, the lowest as a closed interval. Bootstrapped standard errors are displayed in parenthesis. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

Specification	(1)	(2)	(3)	(4)
Female†	-0.517**	-0.547**	-0.518*	-0.567***
	(0.240)	(0.253)	(0.279)	(0.208)
Age	-0.0444***	-0.0334***	-0.0374***	-0.0454***
	(0.0115)	(0.0110)	(0.0109)	(0.00870)
Height	0.888	0.497	0.416	
	(1.887)	(1.830)	(1.853)	
Income (1000 USD-PPP)		0.0352	0.00370	
		(0.0332)	(0.0338)	
Education		0.0887	0.0667	
		(0.0645)	(0.0726)	
Married†		-0.263	-0.244	
		(0.314)	(0.300)	
Household size		-0.0328	0.0172	
		(0.0780)	(0.0669)	
Dependency ratio		-0.169	-0.207	
		(0.171)	(0.197)	
Self-employed†		1.595***	1.579***	1.666***
		(0.466)	(0.429)	(0.451)
Unemployed†		-0.208	-0.216	
		(0.407)	(0.365)	
Civil servant†		-1.055	-1.175	
		(1.015)	(0.918)	
Sick†		0.0603	0.159	
		(0.399)	(0.394)	
Optimism		-0.0491	-0.0391	
		(0.126)	(0.147)	
Vulnerability perceived		-0.115	-0.000537	
		(0.168)	(0.178)	
Vulnerability income		-0.0298	0.0126	
		(0.0636)	(0.0616)	
Buriram†			1.339***	1.456***
			(0.359)	(0.312)
Ubon Ratchathani†			1.605***	1.669***
			(0.309)	(0.340)
Constant	6.064*	5.989*	5.021	6.225***
	(3.234)	(3.141)	(3.243)	(0.485)
$ln(\sigma)$	1.193***	1.176***	1.158***	1.162***
	(0.0179)	(0.0200)	(0.0170)	(0.0162)
Observations	816	816	816	816
McKelvey & Zavoina's R^2	0.0296	0.0618	0.0953	0.0881

Table A.3: Determinants of general risk attitude by education level in Thailand

Interval regression of general risk attitude by education level. General risk attitude is measured on a rating scale on which larger values represent risk lovingness. The highest category is estimated as an open interval, the lowest as a closed interval. Education levels are defined by years which are spent for education. Low education corresponds to 0 to 4 years, medium level to 5 to 6 years, and high education to 7 years and more. Bootstrapped standard errors are displayed in parenthesis. Dummy variables are denoted by †. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Low education level		Medium education level		High education level	
Specification	(1)	(2)	(3)	(4)	(5)	(6)
Female†	-0.101	-0.106	-0.931**	-1.039***	-0.514	-0.542
	(0.174)	(0.185)	(0.446)	(0.396)	(0.486)	(0.474)
Age	-0.0343***	-0.0296***	-0.00879	-0.000691	-0.0189	-0.0167
	(0.00895)	(0.0109)	(0.0235)	(0.0255)	(0.0242)	(0.0184)
Height	0.508	0.240	-0.630	-0.902	1.765	1.198
	(1.130)	(1.207)	(2.657)	(2.460)	(3.262)	(2.734)
Income (1000 USD-PPP)		0.0173		-0.0584*		0.0149
		(0.0215)		(0.0318)		(0.0438)
Married†		-0.121		-0.698		0.0277
		(0.281)		(0.590)		(0.632)
Household size		0.0123		-0.0241		-0.0843
		(0.0568)		(0.104)		(0.143)
Dependency ratio		-0.110		0.0387		-4.00e-05
		(0.135)		(0.196)		(0.339)
Self-employed†		0.687*		0.681*		1.722*
		(0.387)		(0.381)		(0.890)
Unemployed†		-0.178		0.926		-0.316
		(0.286)		(0.598)		(0.682)
Civil servant†		-1.922		-0.0708		-1.329
		(1.281)		(1.489)		(1.585)
Sick†		0.148		-0.390		0.515
		(0.273)		(0.763)		(1.074)
Optimism		-0.0782		0.0858		0.311
		(0.113)		(0.173)		(0.334)
Vulnerability perceived		0.0299		-0.150		-0.0121
		(0.135)		(0.240)		(0.196)
Vulnerability income		-0.0221		0.119**		-0.0364
		(0.0413)		(0.0588)		(0.0818)
Buriram†		0.684***		1.423***		1.342*
		(0.244)		(0.518)		(0.781)
Ubon Ratchathani†		0.696***		2.100***		1.533**
		(0.259)		(0.443)		(0.634)
Constant	6.180***	5.741***	7.228	6.921	4.029	3.661
	(1.945)	(2.061)	(4.487)	(4.398)	(5.773)	(4.587)
$ln(sigma)$	0.927***	0.915***	0.932***	0.860***	0.890***	0.829***
	(0.0219)	(0.0245)	(0.0489)	(0.0523)	(0.0564)	(0.0685)
Observations	944	944	309	309	160	160
McKelvey & Zavoina's R^2	0.0161	0.0401	0.0243	0.155	0.0221	0.134

Table A.4: Determinants of choosing a middle general risk attitude (gra_i=5)

Probit regression of choosing the middle category of the rating scale for general risk attitude. Marginal effects (at mean observation) are displayed, bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

Specification	(1)	(2)	(3)	(4)
Female†	-0.0434	-0.0497	-0.0517*	-0.0517
	(0.0362)	(0.0383)	(0.0312)	(0.0394)
Age	-0.00229**	-0.00391**	-0.00415***	-0.00415**
	(0.00106)	(0.00159)	(0.00139)	(0.00168)
Height	-0.117	-0.141	-0.187	-0.187
	(0.207)	(0.215)	(0.215)	(0.265)
Income (1000 USD-PPP)		-0.00391	-0.00592*	-0.00592
		(0.00338)	(0.00345)	(0.00377)
Education		-0.0182***	-0.0187***	-0.0187***
		(0.00683)	(0.00639)	(0.00717)
Married†		-0.00548	-0.00800	-0.00800
		(0.0421)	(0.0336)	(0.0384)
Household size		0.00151	0.00472	0.00472
		(0.00939)	(0.00874)	(0.0107)
Dependency ratio		-0.0132	-0.0188	-0.0188
		(0.0196)	(0.0208)	(0.0217)
Self-employed†		0.00316	0.00340	0.00340
		(0.0562)	(0.0455)	(0.0581)
Unemployed†		0.0321	0.0290	0.0290
		(0.0610)	(0.0479)	(0.0515)
Civil servant†		-0.161	-0.159	-0.159
		(0.140)	(0.136)	(0.107)
Sick†		-0.0289	-0.0184	-0.0184
		(0.0450)	(0.0446)	(0.0458)
Optimism		0.0129	0.0150	0.0150
		(0.0140)	(0.0146)	(0.0150)
Vulnerability perceived		0.0110	0.0158	0.0158
		(0.0223)	(0.0170)	(0.0240)
Vulnerability income		0.0136**	0.0153**	0.0153**
		(0.00666)	(0.00642)	(0.00734)
Buriram†			0.154***	0.154***
			(0.0417)	(0.0407)
Ubon Ratchathani†			0.102***	0.102***
			(0.0317)	(0.0394)
Observations	1,413	1,413	1,413	1,413
McKelvey & Zavoina's R^2	0.00539	0.0340	0.0496	0.0496

Figure A.1: Relation between general risk attitude and age by country

Frequencies and mean risk attitudes displayed by age category for each country separately.

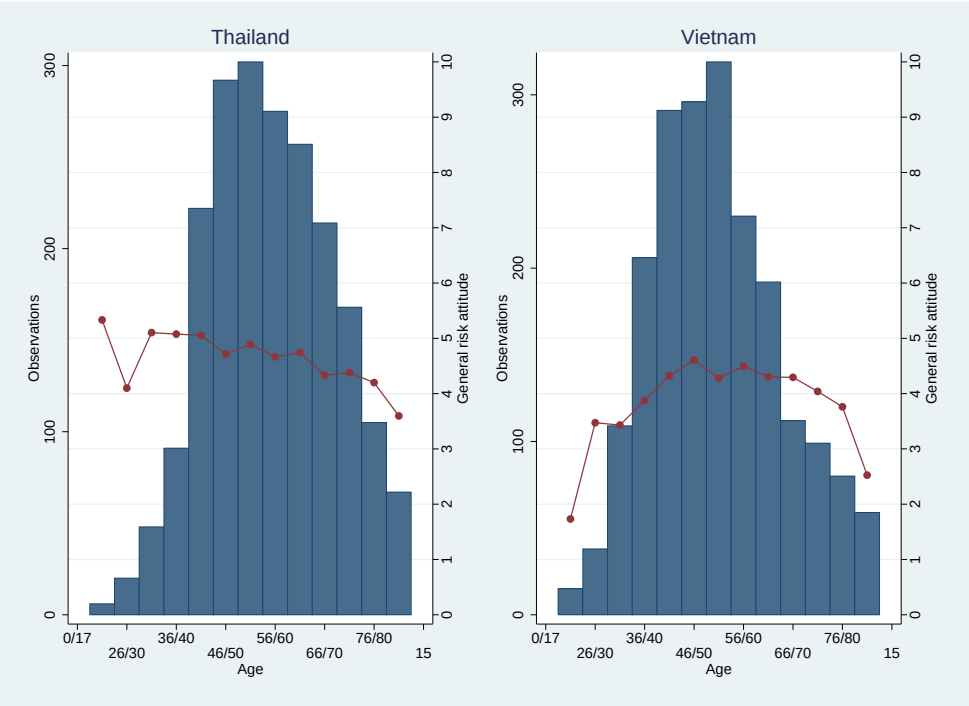

Table A.5: Determinants of lottery expenditures

Least squares regression of lottery expenditures, bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
Specification	(1)	(2)	(3)	(4)	(5)	(6)
General risk attitude	3.495***	3.303***	3.340***	0.131	0.118	0.242
	(0.731)	(0.759)	(0.625)	(0.103)	(0.114)	(0.190)
Female†		3.375	3.075		1.007	1.468
		(4.172)	(4.254)		(0.867)	(1.177)
Age		-0.269*	-0.350*		0.0131	0.0486*
		(0.157)	(0.203)		(0.0167)	(0.0264)
Height		46.25**	39.58		10.08**	8.655*
		(22.92)	(24.53)		(5.007)	(5.181)
Income (1000 USD-PPP)			1.081*			0.144***
			(0.568)			(0.0558)
Education			-1.202			0.138
			(1.031)			(0.124)
Married†			1.858			0.593
			(4.306)			(0.469)
Household size			1.708			-0.0460
			(1.139)			(0.102)
Dependency ratio			0.579			-0.00906
			(2.907)			(0.216)
Self-employed†			-8.776			-1.180
			(6.716)			(0.753)
Unemployed†			4.146			-0.487
			(5.762)			(0.735)
Civil servant†			-16.27			0.849
			(10.46)			(1.497)
Sick†			-7.549			-0.953**
			(5.212)			(0.399)
Optimism			1.852			-0.585
			(1.878)			(0.842)
Vulnerability perceived			-1.437			0.847*
			(2.898)			(0.494)
Vulnerability income			-1.843*			-0.277***
			(1.074)			(0.0973)
Buriram†			1.022			
			(5.408)			
Ubon Ratchathani†			-0.329			
			(5.337)			
Ha Tinh†						-2.789**
						(1.277)
Thua Thien Hue†						-1.604
						(1.268)
Constant	24.92***	-35.57	-23.75	0.377	-16.59*	-17.11*
	(3.226)	(41.75)	(43.91)	(0.382)	(8.740)	(10.31)
Observations	1,413	1,413	1,413	1,254	1,254	1,254
Adjusted R^2	0.0173	0.0201	0.0235	0.000524	0.00188	0.0110

Table A.6: General risk attitude and loss aversion

Display of estimates of the coefficient and the standard error of loss aversion. Regression models keep the same as in the former specifications but the inclusion of loss aversion. Measures of fit for the loss aversion enhanced regression are in the respective last row. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Thailand			Vietnam		
	(1)	(2)	(3)	(1)	(2)	(3)
Panel A: General risk attitude						
β_{Intreg}	0.00122	0.000383	0.000713	0.0174***	0.0126***	0.00878***
SE	(0.00361)	(0.00296)	(0.00309)	(0.00261)	(0.00239)	(0.00281)
McKelvey & Zavoina's R^2	0.0232	0.0420	0.0683	0.0450	0.206	0.259
Panel B: Investment						
β_{LS}	0.0534**	0.0428	0.0406	0.0542	0.0391	0.0194
SE	(0.0229)	(0.0283)	(0.0270)	(0.0374)	(0.0336)	(0.0327)
Adjusted R^2	0.264	0.288	0.288	0.0368	0.0697	0.109
Panel C: Self-employment						
β_{Probit}	1.82e-05	-1.50e-05	2.62e-06	0.000752**	0.000666**	0.000205
SE	(0.000283)	(0.000313)	(0.000314)	(0.000334)	(0.000281)	(0.000277)
McKelvey & Zavoina's R^2	0.0451	0.0656	0.102	0.0430	0.140	0.294
Panel D: Playing lottery						
β_{Probit}	-0.000261	-0.000318	-0.000310	8.46e-05	5.50e-05	3.54e-05
SE	(0.000557)	(0.000597)	(0.000600)	(0.000179)	(0.000179)	(0.000157)
McKelvey & Zavoina's R^2	0.0219	0.0362	0.0502	0.00449	0.0245	0.165
Panel E: Lottery expenditures						
β_{LS}	0.160**	0.143**	0.127*	0.00730	0.00671	0.00459
SE	(0.0623)	(0.0692)	(0.0750)	(0.00783)	(0.00789)	(0.00645)
Adjusted R^2	0.0176	0.0195	0.0207	-0.000208	0.00105	0.00875

Table A.7: Minorities

Bootstrapped standard errors are in parenthesis. Level of significance is denoted by * (≤10%), **(≤5%), ***(≤1%).

	Pooled				Majority				Minorities			
Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Female†	-0.348*	-0.0710	-0.0352		-0.158	0.0607	-0.0318		-1.001**	-0.391	0.172	
	(0.183)	(0.172)	(0.195)		(0.191)	(0.219)	(0.203)		(0.447)	(0.375)	(0.338)	
Age	0.000869	0.0151**	-0.0112		0.00475	0.0210***	-0.00205		-0.0106	0.0174	-0.129**	-0.153
	(0.00576)	(0.00606)	(0.0120)		(0.00705)	(0.00674)	(0.0136)		(0.0133)	(0.0177)	(0.0529)	(0.0985)
Height	0.972	1.290	2.483**	2.565**	3.166**	2.985*	2.936**	2.966**	-6.981**	-3.581	4.432**	4.170**
	(0.942)	(1.228)	(1.185)	(1.134)	(1.453)	(1.674)	(1.497)	(1.220)	(2.950)	(2.429)	(2.183)	(1.973)
Majority (Vietnamese)	1.557***	0.827***	0.716***	0.696***								
	(0.152)	(0.208)	(0.254)	(0.183)								
Income (1000 USD-PPP)		0.0724***	0.0327			0.0611**	0.0285			0.101**	0.0346	
		(0.0222)	(0.0252)			(0.0268)	(0.0265)			(0.0490)	(0.0375)	
Education		0.0519*	0.0612**	0.0645**		0.0456	0.0401	0.0487		0.0762	0.104**	0.108**
		(0.0266)	(0.0273)	(0.0260)		(0.0325)	(0.0315)	(0.0348)		(0.0641)	(0.0502)	(0.0549)
Married†		0.473*	0.463**	0.549***		0.471**	0.454	0.451		0.0574	0.126	
		(0.259)	(0.189)	(0.187)		(0.218)	(0.277)	(0.285)		(0.521)	(0.323)	
Household size		0.0504	0.0740			0.130**	0.148**	0.132**		-0.146	-0.0830	
		(0.0583)	(0.0456)			(0.0575)	(0.0593)	(0.0547)		(0.100)	(0.0694)	
Dependency ratio		-0.0471	-0.0632			-0.172	-0.186			0.398	0.571**	0.550
		(0.112)	(0.119)			(0.119)	(0.130)			(0.423)	(0.255)	(0.364)
Self-employed†		0.299	0.247			0.294	0.314			0.414	0.479	
		(0.298)	(0.236)			(0.352)	(0.307)			(1.308)	(0.949)	
Unemployed†		0.0812	0.180			0.319	0.378			-2.171***	-0.966**	
		(0.295)	(0.290)			(0.351)	(0.349)			(0.626)	(0.458)	
Civil servant†		1.571***	1.387***	1.274***		1.345***	1.341***	1.236*		2.074**	1.553*	1.719**
		(0.401)	(0.410)	(0.425)		(0.398)	(0.388)	(0.631)		(0.934)	(0.823)	(0.778)
Sick†		-0.732***	-0.583***	-0.606***		-0.989***	-0.853***	-0.842***		0.169	0.178	
		(0.196)	(0.176)	(0.159)		(0.194)	(0.174)	(0.177)		(0.410)	(0.274)	
Optimism		0.684***	0.586***	0.600***		0.624***	0.620***	0.629***		0.804***	0.347*	
		(0.0979)	(0.109)	(0.0849)		(0.100)	(0.127)	(0.101)		(0.278)	(0.206)	
Vulnerability perceived		-0.724***	-0.628***	-0.643***		-0.775***	-0.702***	-0.736***		-0.455	-0.336	
		(0.127)	(0.128)	(0.116)		(0.130)	(0.156)	(0.140)		(0.304)	(0.287)	
Vulnerability income		-0.118***	-0.0623			-0.0982*	-0.0553			-0.118	-0.0425	
		(0.0429)	(0.0463)			(0.0505)	(0.0476)			(0.0868)	(0.0653)	
Ha Tinh†			1.296***	1.268***			1.176***	1.133***			2.154***	2.082***
			(0.236)	(0.163)			(0.284)	(0.166)			(0.314)	(0.242)
Thua Thien Hue†			1.705***	1.758***			1.297***	1.340***			2.563***	2.896***
			(0.169)	(0.164)			(0.271)	(0.204)			(0.317)	(0.276)
Vietnam war			-0.0277*	-0.0163**			-0.0224	-0.0248***			-0.163***	-0.181*
			(0.0166)	(0.00665)			(0.0165)	(0.00874)			(0.0566)	(0.0993)
Constant	1.975	1.004	-0.204	-0.846	-0.220	-1.230	-0.478	-0.627	15.20***	8.825**	3.945	4.882
	(1.562)	(2.047)	(2.293)	(1.812)	(2.394)	(2.886)	(2.829)	(1.983)	(4.679)	(4.298)	(4.973)	(7.967)
$ln(sigma)$	0.958***	0.877***	0.842***	0.845***	0.962***	0.876***	0.858***	0.861***	0.917***	0.810***	0.695***	0.713***
	(0.0180)	(0.0206)	(0.0203)	(0.0209)	(0.0205)	(0.0236)	(0.0201)	(0.0226)	(0.0490)	(0.0465)	(0.0517)	(0.0385)
Observations	1,254	1,254	1,254	1,254	1,000	1,000	1,000	1,000	254	254	254	254
McKelvey & Zavoina's R^2	0.0617	0.201	0.255	0.251	0.0118	0.167	0.198	0.192	0.0333	0.220	0.380	0.357